

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Manco et al.)
) Group Art Unit: 1755
Serial No.: 10/820,639)
)
Filed: April 7, 2004) Examiner: Patricia L. Hailey
)
For: METHOD OF MAKING AN ELECTRODE)
FOR A MEMBRANE ELECTRODE)
ASSEMBLY AND METHOD OF MAKING)
THE MEMBRANE ELECTRODE)
ASSEMBLY)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

Sir:

This Amendment is submitted in response to the Final Office Action dated April 10, 2006. Please amend the Application as follows:

IN THE SPECIFICATION

Please amend Paragraph [0036] as follows:

[0036] In making the electrode(s), for example, the ink is first fed onto the screen to wet the screen. Once the screen has been wetted, the ink is printed under a desired pressure by squeegee wherein the electrode layer is formed on the surface of the substrate. The thickness of the electrode layer on the membrane may depend on the thickness of the screen, the viscosity of the ink and the mesh size of the screen. In a start-up operation, the ink is retained in the screen (i.e., the wetting step), which may be about 2 passes using a hand squeegee. The same screen is used for the production of additional electrodes, which results in single (1) pass screen-printing per electrode. As such, this method offers an advantage over existing methods that use 2 or more passes per electrode.

In other words, production time may be reduced compared to methods that ~~use to~~ use two or more passes. Additionally, the resulting electrode has the same activity as an electrode made using 2 passes. However, unlike current electrode designs, the electrodes disclosed herein have a much lower loading. For example, current electrodes designs may have a catalyst metal (e.g., platinum) loading of about 2 milligrams per square centimeter (mg/cm^2) to about $7 \text{ mg}/\text{cm}^2$, whereas electrodes disclosed herein have a platinum loading of less than or equal to about $1.5 \text{ mg}/\text{cm}^2$, with a loading of about $0.5 \text{ mg}/\text{cm}^2$ to about $0.8 \text{ mg}/\text{cm}^2$ preferred. While attaining substantially the same activity, this is a significant improvement over existing electrode loadings, which allows for a reduction in the catalyst material used. As such, electrodes can be made in a shorter amount of time and at a reduced cost compared to electrodes using 2 passes and having a catalyst loading of greater than $2 \text{ mg}/\text{cm}^2$.

IN THE CLAIMS

1. (Cancelled)
2. (Previously Presented) The method of Claim 5, wherein the ester is synthesized from acetic acid.
3. (Previously Presented) The method of Claim 8, wherein the ester is n-propyl acetate.
4. (Previously Presented) The method of Claim 5, wherein the ink further comprises polyvinyl alcohol.
5. (Currently Amended) A method of making an electrode-~~decal~~ layer, comprising:

forming a catalyst ink comprising a catalyst compound, a perfluorinated sulfonyl fluoride polymer, and an ester, wherein the ink comprises about 20 wt% to about 30 wt % of the catalyst compound, about 15 wt% to about 20 wt % the ester, about 40 wt% to about 50 wt% perfluorinated sulfonyl fluoride polymer, and about 5 wt% to about 10 wt% polyvinyl alcohol, wherein the weight percentages are based on the total weight of the ink;

disposing the catalyst ink on a ~~decal~~ substrate; and

drying the catalyst ink to form an ~~the~~ electrode layer on the ~~decal~~ substrate.
6. (Previously Presented) The method of Claim 5, wherein the catalyst compound comprises platinum and the ester is n-propyl acetate.
- 7 – 9 (Cancelled)

10. (Previously Presented) The method of Claim 5, wherein the catalyst compound is selected from the group consisting of platinum, palladium, rhodium, carbon, gold, tantalum, tungsten, ruthenium, iridium, osmium, and an alloy and combination comprising at least one of the foregoing catalyst compounds.

11 – 27 (Cancelled)

28. (Previously Presented) The method of Claim 5, wherein the catalyst compound has a particle size of about 10 nanometers to about 100 nanometers.

29. (Currently Amended) The method of Claim 5, wherein the electrode layer has a thickness of less than or equal to about 2 micrometers.

30 – 31 (Cancelled)

32. (New) The method of Claim 5, wherein the substrate is a decal.

33. (New) The method of Claim 5, wherein the substrate is a proton exchange membrane.

REMARKS

Applicants Attorney would like to thank the Examiner for her time on May 30, 2006, where the amendment to Claim 5 and the new dependent claims were discussed. The amendment to Claim 5 does not effect the reasons for allowance set forth in the Final Office Action. Claim 5, and the dependent claims therefrom remain allowable.

Claims 2-10 and 22-31 are pending in the present Application. Claims 7 – 9, 22 – 27, 30, and 31, have been cancelled, Claims 5 and 29, have been amended, and Claims 2 – 6, 10, 28, and 29 have been allowed. The Specification has been amended to correct a typographical error.

Claim 5 has been amended to remove an unnecessary limitation.

Claim 29 has been amended to provide proper antecedent basis. Support for this amendment can at least be found in Claim 1 as originally filed.

Claims 32 and 33 have been added to further claim the present invention. Support for these claims can be found in Claim 1 as originally filed as well as in Paragraphs [0017] and [0027].

No new matter has been introduced by these amendments and new claims. The amendments and new claims do not increase the number of claims and still meet the examiner's reasons for allowance, hence, entrance of the amendments are respectfully requested. Additionally, reconsideration and allowance of the case are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 24, 26, 27, and 29 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 24, 26, and 27 have been cancelled, and 29 has been amended to change “electrode” to “electrode layer”, consistent with the independent claims and as originally submitted in Claim 1. Reconsideration and withdrawal of this rejection are respectfully requested.

Claim Rejections Under 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a)

Claims 7, 8, 22-25, and 30 stand rejected under 35 U.S.C. §102(e), as allegedly anticipated by U.S. Patent No. 6,844,286 to Kohler et al. Applicants respectfully traverse this rejection. Claims 9, 26, 27, and 31 stand rejected under 35 U.S.C. §103(a), as allegedly unpatentable over U.S. Patent No. 6,844,286 to Kohler et al. in view of U.S. Patent No. 5,702,755 to Mussell. Applicants respectfully traverse these rejections and contend that the claims are allowable in view of the references of record. However, in order to facilitate issuance of the allowed claims, Claims 1 – 9, 22 – 27, 30, and 31 have been cancelled, thereby rendering these rejections moot. Reconsideration and withdrawal of these rejections are respectfully requested.

Allowable Subject Matter

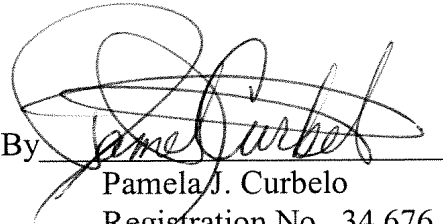
Claims 2-6, 10, 28, and 29 are allowed.

It is believed that the foregoing amendments and remarks fully comply with the Final Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and withdrawal of the rejections and allowance of the case are respectfully requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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